

SECTION 4: ARCHITECTURAL

4.1 General. This section provides architectural design guidance. All facilities should employ an economical, completely functional architectural design. Designs are to be closely governed by standard healthcare, Department of Defense, and Military Department specific functional requirements and criteria specified herein. See Section 12, Accessibility Provisions for the Disabled, for specific guidance on building accessibility.

4.2 External Design. Designs shall be compatible with the context of the site and existing adjacent buildings. Colors, textures and forms of existing buildings or other site features must be considered. Adhere to applicable installation design guidance.

4.2.1 Building Exteriors. Exteriors (elevations) shall conform to or be compatible with the styles of previously constructed permanent facilities of the region or installation, governing Historic Preservation Societies and established design guidance. To ensure compatibility, observe and document during the site visit the physical features of the site and the character and style of any surrounding building(s). Develop elevations based on interior departmental functional relationships and requirements. Where possible, take advantage of existing or developed site assets.

4.2.2 Building Materials. Exterior enclosure shall meet engineering standards with respect to the environment, energy usage, materials and methods of construction. In selecting building materials, give careful consideration to technical criteria and the requirement for high durability and minimal maintenance.

4.2.3 Roof Considerations.

4.2.3.1 Roofing system(s) shall be compatible with structural framing system(s), and provide a complete, readily repairable, waterproof roof. The roofing system shall be durable, require minimal maintenance and provide the fire ratings and classifications required by MIL-HDBK-1008 (reference 4a).

4.2.3.2 Roof slope(s) shall be not less than 21mm/meter (1/4 inch/foot).

4.2.4 Solar Shading. Where air conditioning is not required, adjustable blinds may be one of several design elements used to eliminate direct sunlight glare. In climates where air conditioning is required, solar shading should be accomplished by using any one or combination of the following: solar shading screens or baffles, recessed exterior windows, light-reducing glass, heat-absorbing tinted glass, reflective glass, adjustable blinds. Provide an effective approach to shading of exterior window areas that is life-cycle cost effective, compatible with required comfort levels in working areas and aesthetically compatible with the building design.

4.3 Internal Design. Consider the following factors that affect the quality of a space in terms of their therapeutic effects: changes in daylight, movement of air, changes in temperature, sights and sounds,

human activity and spatial variety with graceful proportion, as well as the selection of materials with compatible textures and colors. See Section 23, Acoustics, for specific guidance on acoustics for architectural spaces and building mechanical systems.

4.3.1 Layouts and Function. Building and departmental floor plan layouts should be simple and functional. Avoid layouts that decrease medical functional efficiencies. Locate permanent plan elements such as mechanical shafts, stairways, and utility rooms to minimize their impact on functional use areas or future expansion of critical areas.

4.3.2 Program for Design. Use the TMA/DMFO-approved Program for Design (PFD) to allocate space assigned to a proposed facility. Modifications must be approved by TMA/DMFO.

4.3.3 Functional Planning and Future Expansion. Relocation of departments having least first-cost is a valuable mechanism for accommodating change. Expansion of expensive existing departments can often be coupled with relocation of lower cost functions. Placing departments on outside walls with adjacent site space available for expansion also adds future flexibility. Open plans, where feasible, allow easy departmental change. Avoid floor plans that encircle a department with permanent corridors, stairs, mechanical rooms, or other building elements difficult to relocate. Reference Section 3, Site Development, paragraph 3.10.

4.3.3.1 Pursue the grouping of functional elements in accordance with the following objectives. Where difficulties arise in the mutual accommodation of all of the following objectives, the objective stated in subparagraph 4.3.3.1.1 below shall be given priority.

4.3.3.1.1 Where appropriate, combine elements on the basis of functional adjacency requirements to facilitate better functional flow and reduced operating and staff costs.

4.3.3.1.2 Combine departments and functions with similar fire code requirements where feasible. For example, the assembly of all outpatient clinical elements which do not serve nonambulatory patients can be constructed to a lower cost as a "business occupancy" rather than the higher cost of a "health care occupancy".

4.3.3.1.3 Combine elements with similar electrical, mechanical and structural requirements to facilitate savings in construction costs.

4.3.3.2 Place soft-functional areas (areas having minimal amounts of plumbing, special finishes, special mechanical features and special power demands) between hard-functional areas (areas having appreciable amounts of plumbing, special finishes, special mechanical features and special power demands) to permit future growth of the hard-functional areas by relocation of the less costly soft-functional areas.

4.3.3.3 Assure column-free functional areas where possible. Provide vertical column compatibility in multi-story facilities. Review Section 6, Seismic Design, for seismic considerations.

4.3.3.4 Design utility areas for electrical, mechanical, plumbing and other support systems in such a manner as to permit modifications in support of medical functional changes with the least life-cycle-cost and least disruption to the overall operations. Locate utility areas for cost effective connections to site utilities and efficient distribution to functional areas. Stack similar utility areas vertically in multi-floor buildings where feasible for improved distribution. Provide adequate space for required safety clearances and for maintenance and repair. See applicable utility sections for additional information.

4.3.4 Atriums/Clinic Malls. Properly designed atriums and clinic malls improve aesthetic conditions, provide natural light to interior patient rooms and establish an environment providing psychological benefits to patients, staff and visitors. The incorporation of an atrium into the design of a multi-story facility has the potential for reducing initial capital investment, construction costs, and associated energy costs. See Section 13, Fire Protection, of this document for fire and life safety design requirements.

4.4 Circulation.

4.4.1 Separation of Traffic. In a multi-story medical facility, elevators are a principal axis of personnel, patient and materiel movement. To reduce the mixing of supplies, visitors, staff and patients, access to and location of different types of elevators should be considered. The objectives of separation are to decrease cross contamination, minimize disturbance of patients, and organize traffic patterns. Reference Section 17, Transportation and Materials Handling.

4.4.2 Circulation Patterns.

4.4.2.1 Provide adequate circulation space at points of traffic congestion. Provide architectural features that emphasize overall circulation patterns and major entrances to departments.

4.4.2.2 Make circulation more efficient by avoiding confusing hallway systems, the extension of through corridors from department to department, dead end departmental corridors, and a horseshoe shape in major corridor systems that require excessive walking distances.

4.4.2.3 Minimize the use of single-loaded corridors.

4.4.2.4 Locate vertical transportation element(s) to be immediately visible and accessible from the major entrances.

4.4.2.5 Main circulation corridors in health care occupancies should be at least 2400mm (8 feet) wide, exclusive of lobbies and elevator vestibules, unless otherwise directed. Minimum corridor widths must comply with NFPA 101 (reference 4b) requirements. Generally, minimum corridor widths shall be 1700mm (5 feet 6 inches) and 2400mm (8 feet), depending on loading and code requirements.

4.5 Floor-to-Floor Heights. Determination of finished-floor to finished-floor heights is a multi-disciplinary task. Special attention must be given to mechanical requirements and clearances. Adequate space shall be provided above finished ceilings for the coordination and

placement of such building systems as mechanical, electrical and communications distribution systems, unique structural considerations and utility piping systems. Elements requiring special ceiling heights should be grouped on the least number of floors consistent with proper functional design. See Appendix A and Section 19, Integrated Building Systems.

4.5.1 Underfloor or Crawl Spaces. Limit crawl spaces or underfloor areas to less than 2130mm (7 feet) in height. Reference Section 2, Design Procedures, Submittals and Documentation, Figure 2-5.

4.6 Exterior Wall Design.

4.6.1 Materials and Assemblies. Select materials that are durable, require low maintenance and are compatible with applicable criteria including Military Handbook 1008.

4.6.2 Joint Locations. Evaluate the design characteristics of walls as they relate to construction and control joint locations, considering impact on sterile areas, construction sequence, and building movement due to expansion and contraction.

4.6.3 Climate Factors. Climate data establishes performance requirements for thermal design of exterior walls. Use overall composite heat transfer or "U" factors in conjunction with local climatological data. Composite "U" factors must conform to criteria in Section 7, Energy and Water Conscious Design, and Section 8, Heating, Ventilation and Air Conditioning (HVAC).

4.6.4 Thermal Resistance. Obtain the thermal characteristics of single materials or wall assemblies from the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) Handbook of Fundamentals (reference 4c) or from manufacturer's certified technical information. Identify thermal resistance (R) values for each element in the building shell. Prepare "U" factor calculations following recommended procedures as documented in the ASHRAE Handbook of Fundamentals (reference 4c). Use thermal transmission values prescribed in Section 7, Energy and Water Conscious Design, Table 7-1.

4.7 Fenestration and Windows.

4.7.1 General. Design fenestration in accordance with National Fire Protection Association (NFPA) codes, HVAC requirements, and installation or command aesthetic appearance criteria. MIL-HDBK-1190 (reference 4d) contains provisions for natural light and ventilation and prescribes minimum glass areas to achieve those provisions in certain facilities, but establishes maximums only for locations designed for less than -18 °C (0 °F) winter design temperature. Design must provide for window cleaning and maintenance.

4.7.2 Required Locations. Exterior windows must be provided in normal nursing care, Intensive Care and Cardiac Care bedrooms, Prosthodontic Dental Treatment Rooms (non-tinted), and Prosthodontic-Ceramics Laboratories (non-tinted). Natural lighting may be provided in Dermatology Clinics, if required by the using Military Department.

4.7.3 Patient Bedroom Windows. Provide windows in patient sleeping rooms in accordance with NFPA 101 (reference 4b). Hardened or protected facilities may require a waiver to this requirement.

4.7.4 Glazing for Impact Safety. Comply with the requirements of ANSI Z97.1 (reference 4e), NFPA 80 (reference 4f) and NFPA 101 (reference 4b). Sill heights less than 760mm (30 in) above the finished floor must have an intermediate horizontal mullion, or suitable alternative, included in the fenestration at that height.

4.8 Interior Construction.

4.8.1 Component Evaluations. Select interior components and their related construction details based on initial cost, life expectancy, housekeeping and maintenance costs, and aseptic characteristics, as applicable. Normally used materials, including their correlation and standard abbreviations, are indicated in Appendix A.

4.8.2 Aseptic Environments. Selection of interior construction and finishes must consider the need for aseptic environments. Use smooth, nonporous, seamless materials, recessed cabinets with radiused inside corners to minimize contamination and reduce housekeeping requirements. Smooth, seamless wall and floor coverings facilitate cleaning. As a minimum, the following areas shall be designed for ease of housekeeping with elimination of materials or surfaces which could harbor contamination, and to minimize maintenance requirements:

- a) Oral Surgery Rooms, Dental Treatment Rooms
- b) Special Procedure Rooms - Cardiac Catheterization, Angiography, Endoscopy, etc.
- c) Operating and Delivery Rooms
- d) Emergency and Trauma Rooms
- e) Decontamination Rooms in Surgery, Delivery, and Central Processing and Distribution (CPD)
- f) Sterile Storage Rooms (Surgery, Delivery, CPD)
- g) Substerile and Recovery Rooms (Surgery and Delivery)
- h) All Patient Treatment Rooms
- i) Intravenous Admixture and Chemotherapy Preparation Rooms in Pharmacy.

4.9 Floors.

4.9.1 Design floors to accommodate different types of wheeled conveyances and to be devoid of abrupt changes in elevation. Maintain constant floor elevation throughout for safety and ease of movement of wheeled equipment. Avoid raised thresholds, steps and ramps. Recess all expansion joint cover plates flush with the finished floor. Provide floor depressions to accommodate cart washers, floor loading sterilizers,

radiographic electrical floor duct, walk-in prefabricated units, i.e. walk-in refrigerators and freezers, controlled temperature rooms, sound suites; RFI shielded rooms, computer rooms, high density shelving and other embedded equipment. Rooms receiving ceramic tile or quarry tile finishes which slope to a floor drain(s) or require a setting bed for installation shall be designed with floor depressions to accommodate tiles and setting beds.

4.9.2 Floor Finishes.

4.9.2.1 Floor finishes shall be as indicated in Appendix A.

4.9.2.2 Limit the specification of carpeting to those areas indicated in Appendix A.

4.10 Wall and Partition Systems. Limit partition systems to masonry or steel stud with gypsum wallboard systems. Construct partition systems with noncombustible materials and design them to conform to applicable portions of the National Fire Codes. Select systems which permit modification with the minimum cost and difficulty within acoustical and fire criteria, except in areas subject to severe impact. Reference Appendix A.

4.10.1 Use of Full Height Partitions. Full height partitions, floor to structural slab above, shall be used in the following rooms, spaces, and compartments for sound attenuation and for physical security purposes:

- a) Medical Record Storage areas (paper file areas or large centralized areas)
- b) Materiel Services Storage areas
- c) Central Processing and Distribution Storage areas
- d) Pharmacy
- e) Prosthodontics and Ceramic Laboratory
- f) Medical Equipment Maintenance and Repair
- g) Orthotic Appliance Manufacturing
- h) Facility Engineer Maintenance Shops
- i) Pulmonary Function and Laboratory
- j) Medical Service Account (MSA) Funds Storage

4.10.2 Clinic office and examination rooms where patient-provider privacy is essential. Perform a cost comparison between the first cost of full height partitions and associated work versus other methods of sound attenuation to determine feasibility for this circumstance. See Section 23, Acoustics, for additional information.

4.10.3 Barriers. Design protective barrier partitions to protect occupants or equipment in rooms, spaces and compartments from fire, smoke, radiation exposure, electrical interference, MRI shielding, or for physical security purposes; reference Appendix C for specific radiation shielding criteria. Reinforced masonry or concrete partitions are strongly desirable around areas where the physical security of valuables or drugs is required; reference Section 14, Physical Security.

4.10.4 Protection. Use bumper guards on walls in areas subject to frequent abrasion and impact, such as corridors, utility rooms, central processing and distribution (CPD), gurney storage and others. Bumper guards shall comply with the requirements in Section 12, Accessibility Provisions for the Disabled, if they are used as handrails in corridors and accessible pathways. Consider the use of bumper guards above the floor base at reception counters, nurses stations and dispensing windows that are designed for accessibility by wheelchair-bound patients. Mechanically mount bumper guards to appropriate wall blocking where steel stud partitions are used and extend outward from the wall to afford the needed protection. Provide corner guards at outside corners of walls, corridors, and in areas and rooms subject to damage by mobile equipment. Design corner guards to extend from the floor to the finished ceiling. Masonry partitions also require corner guards. Do not use bullnose masonry corner units.

4.10.5 Reinforcement. Wall partitions require additional reinforcing for positive attachment of surface-mounted items such as casework, wall bumpers, toilet accessories, and other equipment.

4.11 Ceilings. Select a ceiling system based on initial cost, surface visual appeal, resistance to moisture, fire resistance rating, lighting, HVAC outlets, security, maintenance, and acoustical requirements. Reference Appendix A.

4.11.1 Support. Use of suspended ceiling surfaces for the direct support of intravenous infusion tracks, cubicle curtain tracks, and ceiling lights is not acceptable. Ceiling-mounted accessories shall be secured through the ceiling to secondary support members. Use universal suspension systems in all radiographic rooms -- reference Section 16, Medical and Dental Equipment, and Appendix C (Universal X-Ray Room).

4.11.2 Utility Access. Provide maximum accessibility in corridor ceilings to the mechanical and electrical distribution systems. Do not use concealed-spline ceiling systems requiring special tools to lower tile assemblies. Color-code the access panels into ceiling plenums with tabs to identify the type of utility present. Reference Section 19, Integrated Building Systems.

4.11.3 Moisture Protection. When acoustic treatment is required in the presence of high levels of moisture, use plastic-faced acoustic tiles.

4.11.4 Ceiling Heights. Maximum ceiling heights shall be as indicated in Appendix A.

4.12 Interior Finishes.

4.12.1 Objective. The prime objective of interior design services is to create an environment that evokes a desired attitude and orientation in patients in order to promote the delivery, and more importantly, the acceptance of health care. The patient should perceive action patterns and images advocating a "return to normal life function". The interior designer should avoid a strictly "institutional" effect in all patient contact areas, including offices routinely visited by patients. One source of guidance on interior design is contained in DG 1110-3-122, "Design Guide for Interiors" (reference 4g).

4.12.2 Requirements. Interior finishes for all rooms and areas are specified in Appendix A. The A-E shall, upon request by the using Military Department in coordination with the Design Agent, provide all services and information necessary for a complete, integrated interior design package for the entire facility. The package should include, but not be limited to the following: interior design and coordination related to selection and layout of furniture and furnishings; selection of color and material finish; and design of graphics having a visual impact on interior design. The package should contain documentation for procurement of furniture and furnishings by the government, including a bill of materials, furniture and equipment placement plans, specifications and cost estimates. It will also include wall and floor coverings and furniture that are part of the facility design. Healthcare facility design should include the planning and specification of an integrated modular medical support system that provides integrated components that are interchangeable between administrative, clinical, healthcare materiel management and handling, pharmacy, laboratory, and nurse stations. This integrated system should address applicable infection control requirements, chemical resistant criteria, and any seismic condition requirements for the project. Organizational equipment such as typewriters, personal computers and peripheral devices, and normal furniture replacement items will not be funded as part of the construction project.

4.12.3 Interior Materials. All items used for interior furnishings must conform to applicable codes and standards. All interior fabric finish materials shall be selected from major fabric sources and must be fire retardant or chemically treated for fire resistance. Draperies and other window treatments shall be coordinated with heating, air conditioning and exterior wall profiles to avoid interference with designed airflow.

4.13 Vestibules and Doors.

4.13.1 Exterior Vestibules. Vestibules should be provided at exterior entrances. Vestibules shall comply with UFAS and ADAAG requirements and be of sufficient depth to allow the outside doors to close before the inside doors are opened. A minimum of 3.65M (12'-0") is recommended for any major entrance to avoid "wind tunnel" effects.

4.13.2 Revolving Doors. Revolving doors may be provided when justified and all code requirements are met. When revolving doors are provided, the NFPA 101 (reference 4b) and accessibility requirements to have normal swinging doors for emergency egress are still required.

4.13.3 Automatic Doors. Electrically operated or hydraulically operated automatic doors should be provided for Emergency Trauma entrances of Medical Treatment Facilities and other selected Medical Treatment Facility entrances based on facility size and mission. When functionally appropriate, automatic doors should be considered for interior use on facilities.

4.13.4 Doors, Frames and Hardware. Door sizes are as indicated in Appendix A. Unless otherwise required, all doorframes shall be hollow metal. Door hardware shall be of the highest quality, provide durability in a high use occupancy, meet ADAAG/UFAS requirements, and be aesthetically compatible with the design of the facility. A source of guidance on appropriate hardware selections and schedules is contained in reference 4h.

4.14 Color Selections.

4.14.1 Color selections shall comply with applicable design guides and installation criteria.

4.14.2 Coordinate color selection with the quality and quantity of light provided in each space. Color schemes proposed to change existing interiors must not exceed the capability of the existing lighting system to illuminate the selected colors to required brightness levels.

4.14.3 Select all non-proprietary paint colors from a nationally recognized paint manufacturer. Coordinate the colors with the basic architectural finish schedule.

4.14.4 Select colors with regard to their effect on the maintainability and function of the space. Special consideration must be given to worktops in laboratory areas and maintenance shops where staining from various solutions is a problem.

4.14.5 Select colors and patterns with regard to their impact on the health and welfare of the patient and staff. Color selections should be made from a limited pallet to coordinate with all finishes and accessories.

4.14.6 Provide lighter colors with improved light reflectivity characteristics, where feasible, for improved functional lighting levels. Provide matte surface finishes where glare due to high gloss finish could decrease functional visibility.

4.15 Signage. See Section 21, Wayfinding and Signage.

4.16 Acoustics. See Section 23, Acoustics.

4.17 Sustainable Design. Sustainable design is the design, construction, operation and reuse/removal of the built environment (infrastructure and buildings) in an environmentally and energy efficient manner. All medical facilities shall incorporate sustainable design features to the greatest extent possible, maintaining the functional and operational requirements of the facility. Specific guidance on sustainable design shall be obtained from the Design Agent.

- 4.18 Provisions for Mental Health Facilities. Not included.
- 4.19 Provisions for Hypobaric and Hyperbaric Facilities. Not
included.

REFERENCES

- 4a. MIL-HDBK-1008, "Fire Protection for Facilities Engineering Design and Construction." (latest edition)
- 4b. NFPA 101, "Life Safety Code", National Fire Protection Association, latest edition.
- 4c. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), "Handbook of Fundamentals", latest edition.
- 4d. MIL-HDBK-1190, "Facility Planning and Design Guide".
- 4e. ANSI Z97.1, "Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test", American National Standards Institute.
- 4f. NFPA 80, "Standard for Fire Doors and Fire Windows", National Fire Protection Association, latest edition.
- 4g. DG 1110-3-122, "Design Guide for Interiors", U.S. Army Corps of Engineers, September 1997.
- 4h. Door and Hardware Institute, "Hardware for Health Care Facilities", June 1993.